

Claims:

We claim:

1. A membrane filtration device, for withdrawing permeate from a multicomponent liquid substrate, said membrane device comprising:
 - a multiplicity of hollow fiber membranes, or fibers, unconfined in a shell of a module, said fibers together having a surface area $>1 \text{ m}^2$, said fibers being swayable in said substrate and each fiber having a length >0.5 meter;
 - a first header and a second header disposed in vertically spaced-apart relationship;
 - said first header and said second header having opposed ends of each fiber sealingly secured therein, all open ends of said fibers open to a permeate-discharging face of at least one header;
 - permeate collection means to collect said permeate, sealingly connected in open fluid communication with a permeate-discharging face of at least one of said headers;
 - means to withdraw said permeate;
 - said fibers, said headers and said permeate collection means together forming an integrated combination wherein said fibers are essentially vertically disposed and ends of individual fibers are potted in closely spaced-apart relationship in cured resin;
 - said first header being upper and disposed in vertically spaced-apart relationship above said second header, with opposed faces at a fixed distance;
 - each of said fibers having a length from 0.1% to less than 5% greater than said fixed distance so as to permit restricted displacement of an intermediate portion of each fiber, independently of the movement of another fiber.
2. The membrane filtration device of claim 1 wherein all of the fibers, the headers and the permeate collection means are all submersible below the surface of the substrate.
3. The membrane filtration device of claim 2 wherein the permeate collection means has a fitting or outlet for connecting to a permeate pipe

extending from the permeate collection means to a point above the surface of the substrate.

4. The membrane filtration device of claim 3 wherein the permeate collection means is a permeate pan or cap covering the at least one permeate discharging face.

5. A membrane filtration system comprising

(a) a tank for holding a substrate at ambient pressure during filtration;

(b) a membrane filtration device according to claim 1 immersed below the surface of the substrate;

(c) an aeration system for producing bubbles in the substrate which contact the fibers; and,

(d) a source of suction in fluid communication with the membrane filtration device.

6. The membrane filtration system of claim 5 further comprising a backwashing system for backwashing the membrane filtration device with a liquid.

7. The membrane filtration system of claim 6 wherein the liquid is permeate.